MIL Style CSR09, CSR13, CSR23 and CSR33

Solid-Electrolyte TANTALEX® Capacitors
to Military Specification MIL-C-39003

SOLID-ELECTROLYTE Tantalex capacitors to Military Specification MIL-C-39003 are hermetically-sealed, metal-cased, axial-lead tubular capacitors manufactured as MIL Styles CSR09, CSR13, CSR23 and CSR33. These capacitors are furnished to the requirements of the military specification including marking, testing and inspection.

For information on the performance characteristics of these capacitors, please refer to the latest issue of the military specification.

In accordance with the specification, all capacitors are marked with the MIL Part Number (M39003/XX-XXXX) rather than the older Style designation (CSRXXXXXXXX), and should be ordered as such. All capacitors covered by MIL-C-39003 are now ordered with the MIL Part Number as illustrated below. Capacitors must not be ordered using the Style number identification.

MIL-C-39003 establishes 1,000 hour failure rate levels of 1%, 0.1%, 0.01% and 0.001%. Care must be exercised in ordering to insure the part number correctly identifies the desired failure rate level.

In addition, each order for MIL Style CSR09, CSR13, CSR23 or CSR33 capacitors requiring government inspection must state whether inspection is to be at the destination or at the Sprague plant. Orders requiring source inspection cannot be shipped until this has been accomplished.

Style CSR99 capacitors previously shown in MIL-C-39003 have been superseded and directly replaced by Style CSR13. Additionally, Style CS13 capacitors previously shown in MIL-C-26655 are directly replaced by Style CSR13. Style CSR23 capacitors are extended capacitance range versions of MIL Style CSR13.

MILITARY SPECIFICATION MIL-C-39003 PART NUMBERING SYSTEM

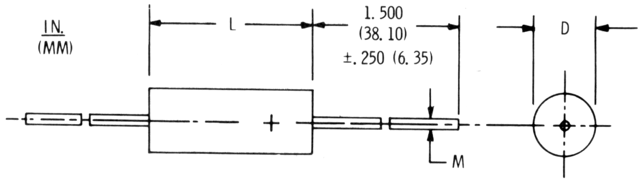
M39003 / 02 - 1001

- 1001 — **DASH NUMBER.** TAKEN FROM TABLES ON THE FOLLOWING PAGES.
- 02 — **DETAIL SPECIFICATION NUMBER.** INDICATES THE DETAIL SPECIFICATION OF THE BASIC MILITARY SPECIFICATION.
- M39003 — **BASIC DOCUMENT NUMBER.** INDICATES THE BASIC SPECIFICATION; IN THIS CASE MIL-C-39003.

The material in this engineering bulletin has been abstracted from MIL-C-39003E, Specification Sheets 1E, 2C, 3B and 6.

SPRAGUE ELECTRIC COMPANY
a Unit of The Penn Central Corporation

STYLE CSR09

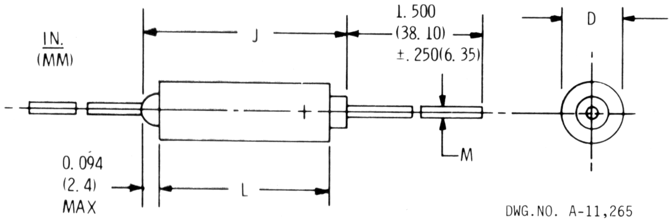


Case Size	L Min.	L Nom.	L Max.	D Min.	D Nom.	D Max.	M Min.	M Nom.	M Max.
	DIMENSIONS IN INCHES								
A1	0.235	0.250	0.281	0.081	0.090	0.099	0.015	0.016	0.021
B1	0.375	0.390	0.405	0.128	0.138	0.148	0.015	0.016	0.021

Case Size	L Min.	L Nom.	L Max.	D Min.	D Nom.	D Max.	M Min.	M Nom.	M Max.
	DIMENSIONS IN MILLIMETRES*								
A1	5.97	6.35	7.14	2.06	2.29	2.51	0.38	0.41	0.53
B1	9.53	9.91	10.29	3.25	3.51	3.76	0.38	0.41	0.53

*1″ = 25.4 mm

STYLE CSR13
STYLE CSR23
STYLE CSR33



Case Size	L ±.031	+.016 D −.015	M ±.002	J Max.
	DIMENSIONS IN INCHES			
A	0.286	0.135	0.020	0.422
B	0.474	0.185	0.020	0.610
C	0.686	0.289	0.025	0.822
D	0.786	0.351	0.025	0.922

Case Size	L ±0.79	+0.41 D −0.38	M ±0.05	J Max.
	DIMENSIONS IN MILLIMETRES*			
A	7.26	3.43	0.51	10.72
B	12.04	4.70	0.51	15.49
C	17.42	7.34	0.64	20.88
D	19.96	8.92	0.64	23.42

*1″ = 25.4 mm

NOTES:
1. These capacitors are not intended to be mounted by their leads.
2. The case insulation shall extend 0.015 inch (0.38 mm) minimum beyond each end. However, when a shrink-fitted insulation is used, it shall lap over the ends of the capacitor body.
3. A minimum lead length of 1 inch for use with tape and reel automatic insertion equipment is available upon request.

D-C WORKING VOLTAGE AND SURGE VOLTAGE (applicable to all types)

D-C Rated Voltage +85°C	D-C Rated Voltage +125°C	D-C Surge Voltage +85°C
6	4	8
10	7	13
15	10	20
20	13	26
35	23	46
50	33	65
75	50	98
100	67	130

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STYLE CSR09 - (Cont.)
PART NUMBER M39003/02-XXXX

μF	Case Code	Cap. Tol. +%	Part No. M39003/02- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C	+25°C	+85°C/+125°C
					35 VOLTS D-C WORKING AT +85°C (Cont.)							
2.2	B1	5	1028	1088	1148	1208	1.4	15.4	26.2	4	3	4
2.2	B1	10	0028	0088	0148	0208	1.4	15.4	26.2	4	3	4
2.7	B1	5	1029	1089	1149	1209	1.4	18.9	32.1	4	3	4
2.7	B1	10	0029	0089	0149	0209	1.4	18.9	32.1	4	3	4
					50 VOLTS D-C WORKING AT +85°C							
0.22	A1	5	1030	1090	1150	1210	0.6	6.0	8.0	4	3	4
0.22	A1	10	0030	0090	0150	0210	0.6	6.0	8.0	4	3	4
0.27	A1	5	1031	1091	1151	1211	0.6	6.0	8.0	4	3	4
0.27	A1	10	0031	0091	0151	0211	0.6	6.0	8.0	4	3	4
1.5	B1	5	1032	1092	1152	1212	1.4	15.0	25.5	4	3	4
1.5	B1	10	0032	0092	0152	0212	1.4	15.0	25.5	4	3	4
1.8	B1	5	1033	1093	1153	1213	1.4	18.0	30.6	4	3	4
1.8	B1	10	0033	0093	0153	0213	1.4	18.0	30.6	4	3	4
					75 VOLTS D-C WORKING AT +85°C							
0.047	A1	5	1034	1094	1154	1214	0.6	6.0	8.0	4	3	4
0.047	A1	10	0034	0094	0154	0214	0.6	6.0	8.0	4	3	4
0.056	A1	5	1035	1095	1155	1215	0.6	6.0	8.0	4	3	4
0.056	A1	10	0035	0095	0155	0215	0.6	6.0	8.0	4	3	4
0.068	A1	5	1036	1096	1156	1216	0.6	6.0	8.0	4	3	4
0.068	A1	10	0036	0096	0156	0216	0.6	6.0	8.0	4	3	4
0.082	A1	5	1037	1097	1157	1217	0.6	6.0	8.0	4	3	4
0.082	A1	10	0037	0097	0157	0217	0.6	6.0	8.0	4	3	4
0.10	A1	5	1038	1098	1158	1218	0.6	6.0	8.0	4	3	4
0.10	A1	10	0038	0098	0158	0218	0.6	6.0	8.0	4	3	4
0.12	A1	5	1039	1099	1159	1219	0.6	6.0	8.0	4	3	4
0.12	A1	10	0039	0099	0159	0219	0.6	6.0	8.0	4	3	4
0.15	A1	5	1040	1100	1160	1220	0.6	6.0	8.0	4	3	4
0.15	A1	10	0040	0100	0160	0220	0.6	6.0	8.0	4	3	4
0.18	A1	5	1041	1101	1161	1221	0.6	6.0	8.0	4	3	4
0.18	A1	10	0041	0101	0161	0221	0.6	6.0	8.0	4	3	4
0.22	B1	5	1042	1102	1162	1222	0.6	6.0	8.0	4	3	4
0.22	B1	10	0042	0102	0162	0222	0.6	6.0	8.0	4	3	4
0.27	B1	5	1043	1103	1163	1223	0.6	6.0	8.0	4	3	4
0.27	B1	10	0043	0103	0163	0223	0.6	6.0	8.0	4	3	4
0.33	B1	5	1044	1104	1164	1224	0.6	6.0	8.4	4	3	4
0.33	B1	10	0044	0104	0164	0224	0.6	6.0	8.4	4	3	4
0.39	B1	5	1045	1105	1165	1225	0.6	6.0	9.9	4	3	4
0.39	B1	10	0045	0105	0165	0225	0.6	6.0	9.9	4	3	4
0.47	B1	5	1046	1106	1166	1226	0.6	7.0	12.0	4	3	4
0.47	B1	10	0046	0106	0166	0226	0.6	7.0	12.0	4	3	4
0.56	B1	5	1047	1107	1167	1227	0.6	8.4	14.3	4	3	4
0.56	B1	10	0047	0107	0167	0227	0.6	8.4	14.3	4	3	4
0.68	B1	5	1048	1108	1168	1228	0.6	10.2	17.3	4	3	4
0.68	B1	10	0048	0108	0168	0228	0.6	10.2	17.3	4	3	4
0.82	B1	5	1049	1109	1169	1229	0.7	12.3	20.9	4	3	4
0.82	B1	10	0049	0109	0169	0229	0.7	12.3	20.9	4	3	4
1.0	B1	5	1050	1110	1170	1230	0.9	15.0	25.5	4	3	4
1.0	B1	10	0050	0110	0170	0230	0.9	15.0	25.5	4	3	4
1.2	B1	5	1051	1111	1171	1231	0.9	18.0	30.6	4	3	4
1.2	B1	10	0051	0111	0171	0231	0.9	18.0	30.6	4	3	4

STYLE CSR09
PART NUMBER M39003/02-XXXX

µF	Case Code	Cap. Tol. ±%	Part No. M39003/02- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in µA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C	+25°C	+85°C/+125°C
6 VOLTS D-C WORKING AT +85°C												
2.7	A1	5	1001	1061	1121	1181	0.6	6.0	8.0	8	6	6
2.7	A1	10	0001	0061	0121	0181	0.6	6.0	8.0	8	6	6
18.0	B1	5	1002	1062	1122	1182	1.4	21.6	36.7	8	6	6
18.0	B1	10	0002	0062	0122	0182	1.4	21.6	36.7	8	6	6
10 VOLTS D-C WORKING AT +85°C												
1.8	A1	5	1007	1067	1127	1187	0.6	6.0	8.0	8	6	6
1.8	A1	10	0007	0067	0127	0187	0.6	6.0	8.0	8	6	6
2.2	A1	5	1008	1068	1128	1188	0.6	6.0	8.0	8	6	6
2.2	A1	10	0008	0068	0128	0188	0.6	6.0	8.0	8	6	6
10.0	B1	5	1009	1069	1129	1189	2.5	20.0	34.0	8	6	6
10.0	B1	10	0009	0069	0129	0189	2.5	20.0	34.0	8	6	6
12.0	B1	5	1010	1070	1130	1190	2.5	24.0	40.8	8	6	6
12.0	B1	10	0010	0070	0130	0190	2.5	24.0	40.8	8	6	6
15.0	B1	5	1011	1071	1131	1191	2.5	30.0	51.0	8	6	6
15.0	B1	10	0011	0071	0131	0191	2.5	30.0	51.0	8	6	6
15 VOLTS D-C WORKING AT +85°C												
1.0	A1	5	1012	1072	1132	1192	0.6	6.0	8.0	8	6	6
1.0	A1	10	0012	0072	0132	0192	0.6	6.0	8.0	8	6	6
1.2	A1	5	1013	1073	1133	1193	0.6	6.0	8.0	8	6	6
1.2	A1	10	0013	0073	0133	0193	0.6	6.0	8.0	8	6	6
1.5	A1	5	1014	1074	1134	1194	0.6	6.0	8.0	8	6	6
1.5	A1	10	0014	0074	0134	0194	0.6	6.0	8.0	8	6	6
8.2	B1	5	1015	1075	1135	1195	1.8	24.6	42.0	8	6	6
8.2	B1	10	0015	0075	0135	0195	1.8	24.6	42.0	8	6	6
20 VOLTS D-C WORKING AT +85°C												
.56	A1	5	1016	1076	1136	1196	0.6	6.0	8.0	4	3	4
.56	A1	10	0016	0076	0136	0196	0.6	6.0	8.0	4	3	4
.68	A1	5	1017	1077	1137	1197	0.6	6.0	8.0	4	3	4
.68	A1	10	0017	0077	0137	0197	0.6	6.0	8.0	4	3	4
.82	A1	5	1018	1078	1138	1198	0.6	6.0	8.0	4	3	4
.82	A1	10	0018	0078	0138	0198	0.6	6.0	8.0	4	3	4
1.0	A1	5	1019	1079	1139	1199	0.6	6.0	8.0	4	3	4
1.0	A1	10	0019	0079	0139	0199	0.6	6.0	8.0	4	3	4
3.3	B1	5	1020	1080	1140	1200	1.0	13.2	22.4	4	3	4
3.3	B1	10	0020	0080	0140	0200	1.0	13.2	22.4	4	3	4
3.9	B1	5	1021	1081	1141	1201	2.0	15.6	26.5	4	3	4
3.9	B1	10	0021	0081	0141	0201	2.0	15.6	26.5	4	3	4
4.7	B1	5	1022	1082	1142	1202	2.0	18.8	32.0	4	3	4
4.7	B1	10	0022	0082	0142	0202	2.0	18.8	32.0	4	3	4
5.6	B1	5	1023	1083	1143	1203	2.0	22.4	38.1	4	3	4
5.6	B1	10	0023	0083	0143	0203	2.0	22.4	38.1	4	3	4
6.8	B1	5	1024	1084	1144	1204	2.0	27.2	46.2	4	3	4
6.8	B1	10	0024	0084	0144	0204	2.0	27.2	46.2	4	3	4
35 VOLTS D-C WORKING AT +85°C												
0.33	A1	5	1025	1085	1145	1205	0.6	6.0	8.0	4	3	4
0.33	A1	10	0025	0085	0145	0205	0.6	6.0	8.0	4	3	4
0.39	A1	5	1026	1086	1146	1206	0.6	6.0	8.0	4	3	4
0.39	A1	10	0026	0086	0146	0206	0.6	6.0	8.0	4	3	4
0.47	A1	5	1027	1087	1147	1207	0.6	6.0	8.0	4	3	4
0.47	A1	10	0027	0087	0147	0207	0.6	6.0	8.0	4	3	4

STYLE CSR13
PART NUMBER M39003/01-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
					6 VOLTS D-C WORKING AT +85°C						
5.6	A	5	5001	5201	5401	5601	0.3	6	7.5	4	4
5.6	A	10	2241	2481	2721	2961	0.3	6	7.5	4	4
6.8	A	5	5002	5202	5402	5602	0.3	6	7.5	6	6
6.8	A	10	2242	2482	2722	2962	0.3	6	7.5	6	6
6.8	A	20	2243	2483	2723	2963	0.3	6	7.5	6	6
47.0	B	5	5003	5203	5403	5603	1.5	24	30.0	6	6
47.0	B	10	2244	2484	2724	2964	1.5	24	30.0	6	6
47.0	B	20	2245	2485	2725	2965	1.5	24	30.0	6	6
56.0	B	5	5004	5204	5404	5604	1.5	24	30.0	6	6
56.0	B	10	2246	2486	2726	2966	1.5	24	30.0	6	6
150.0	C	5	5005	5205	5405	5605	4.5	90	113.0	8	8
150.0	C	10	2247	2487	2727	2967	4.5	90	113.0	8	8
150.0	C	20	2248	2488	2728	2968	4.5	90	113.0	8	8
180.0	C	5	5006	5206	5406	5606	5.5	110	138.0	8	8
180.0	C	10	2249	2489	2729	2969	5.5	110	138.0	8	8
270.0	D	5	5007	5207	5407	5607	6.5	130	163.0	8	8
270.0	D	10	2250	2490	2730	2970	6.5	130	163.0	8	8
330.0	D	5	5008	5208	5408	5608	7.5	150	188.0	8	8
330.0	D	10	2251	2491	2731	2971	7.5	150	188.0	8	8
330.0	D	20	2252	2492	2732	2972	7.5	150	188.0	8	8
					10 VOLTS D-C WORKING AT +85°C						
3.9	A	5	5009	5200	5409	5609	0.3	6	7.5	4	4
3.9	A	10	2253	2493	2733	2973	0.3	6	7.5	4	4
4.7	A	5	5010	5210	5410	5610	0.4	7	8.8	4	4
4.7	A	10	2254	2494	2734	2974	0.4	7	8.8	4	4
4.7	A	20	2255	2495	2735	2975	0.4	7	8.8	4	4
27.0	B	5	5011	5211	5411	5611	2.0	40	50.0	6	6
27.0	B	10	2256	2496	2736	2976	2.0	40	50.0	6	6
33.0	B	5	5012	5212	5412	5612	2.5	50	63.0	6	6
33.0	B	10	2257	2497	2737	2977	2.5	50	63.0	6	6
33.0	B	20	2258	2498	2738	2978	2.5	50	63.0	6	6
39.0	B	5	5013	5213	5413	5613	2.5	50	63.0	6	6
39.0	B	10	2259	2499	2739	2979	2.5	50	63.0	6	6
82.0	C	5	5014	5214	5414	5614	4.0	80	100.0	6	6
82.0	C	10	2260	2500	2740	2980	4.0	80	100.0	6	6
100.0	C	5	5015	5215	5415	5615	5.0	100	125.0	8	8
100.0	C	10	2261	2501	2741	2981	5.0	100	125.0	8	8
100.0	C	20	2262	2502	2742	2982	5.0	100	125.0	8	8
120.0	C	5	5016	5216	5416	5616	6.0	120	150.0	8	8
120.0	C	10	2263	2503	2743	2983	6.0	120	150.0	8	8
180.0	D	5	5017	5217	5417	5617	9.0	180	226.0	8	8
180.0	D	10	2264	2504	2744	2984	9.0	180	226.0	8	8
220.0	D	5	5018	5218	5418	5618	10.0	200	250.0	8	8
220.0	D	10	2265	2505	2745	2985	10.0	200	250.0	8	8
220.0	D	20	2266	2506	2746	2986	10.0	200	250.0	8	8
					15 VOLTS D-C WORKING AT +85°C						
2.7	A	5	5019	5219	5419	5619	0.3	6	7.5	4	4
2.7	A	10	2267	2507	2747	2987	0.3	6	7.5	4	4
3.3	A	5	5020	5220	5420	5620	0.4	8	10.0	4	4
3.3	A	10	2268	2508	2748	2988	0.4	8	10.0	4	4
3.3	A	20	2269	2509	2749	2989	0.4	8	10.0	4	4

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
15 VOLTS D-C WORKING AT +85°C (Cont.)											
18.0	B	5	5021	5221	5421	5621	2.0	35	44.0	6	6
18.0	B	10	2270	2510	2750	2990	2.0	35	44.0	6	6
22.0	B	5	5022	5222	5422	5622	2.0	40	50.0	6	6
22.0	B	10	2271	2511	2751	2991	2.0	40	50.0	6	6
22.0	B	20	2272	2512	2752	2992	2.0	40	50.0	6	6
56.0	C	5	5023	5223	5423	5623	4.0	80	100.0	6	6
56.0	C	10	2273	2513	2753	2993	4.0	80	100.0	6	6
68.0	C	5	5024	5224	5424	5624	5.0	100	125.0	6	6
68.0	C	10	2274	2514	2754	2994	5.0	100	125.0	6	6
68.0	C	20	2275	2515	2755	2995	5.0	100	125.0	6	6
120.0	D	5	5025	5225	5425	5625	9.0	180	226.0	8	8
120.0	D	10	2276	2516	2756	2996	9.0	180	226.0	8	8
150.0	D	5	5026	5226	5426	5626	10.0	200	250.0	8	8
150.0	D	10	2277	2517	2757	2997	10.0	200	250.0	8	8
150.0	D	20	2278	2518	2758	2998	10.0	200	250.0	8	8
20 VOLTS D-C WORKING AT +85°C											
1.2	A	5	5027	5227	5427	5627	0.3	6	7.5	4	4
1.2	A	10	2279	2519	2759	2999	0.3	6	7.5	4	4
1.5	A	5	5028	5228	5428	5628	0.3	6	7.5	4	4
1.5	A	10	2280	2520	2760	3000	0.3	6	7.5	4	4
1.5	A	20	2281	2521	2761	3001	0.3	6	7.5	4	4
1.8	A	5	5029	5229	5429	5629	0.3	6	7.5	4	4
1.8	A	10	2282	2522	2762	3002	0.3	6	7.5	4	4
2.2	A	5	5030	5230	5430	5630	0.4	8	10.0	4	4
2.2	A	10	2283	2523	2763	3003	0.4	8	10.0	4	4
2.2	A	20	2284	2524	2764	3004	0.4	8	10.0	4	4
8.2	B	5	5031	5231	5431	5631	1.0	20	25.0	6	6
8.2	B	10	2285	2525	2765	3005	1.0	20	25.0	6	6
10.0	B	5	5032	5232	5432	5632	1.5	30	38.0	6	6
10.0	B	10	2286	2526	2766	3006	1.5	30	38.0	6	6
10.0	B	20	2287	2527	2767	3007	1.5	30	38.0	6	6
12.0	B	5	5033	5233	5433	5633	1.8	35	44.0	6	6
12.0	B	10	2288	2528	2768	3008	1.8	35	44.0	6	6
15.0	B	5	5034	5234	5434	5634	2.0	40	50.0	6	6
15.0	B	10	2289	2529	2769	3009	2.0	40	50.0	6	6
15.0	B	20	2290	2530	2770	3010	2.0	40	50.0	6	6
27.0	C	5	5035	5235	5435	5635	2.5	50	63.0	6	6
27.0	C	10	2291	2531	2771	3011	2.5	50	63.0	6	6
33.0	C	5	5036	5236	5436	5636	3.5	70	88.0	6	6
33.0	C	10	2292	2532	2772	3012	3.5	70	88.0	6	6
33.0	C	20	2293	2533	2773	3013	3.5	70	88.0	6	6
39.0	C	5	5037	5237	5437	5637	4.0	80	100.0	6	6
39.0	C	10	2294	2534	2774	3014	4.0	80	100.0	6	6
47.0	C	5	5038	5238	5438	5638	4.5	90	113.0	6	6
47.0	C	10	2295	2535	2775	3015	4.5	90	113.0	6	6
47.0	C	20	2296	2536	2776	3016	4.5	90	113.0	6	6
56.0	D	5	5039	5239	5439	5639	5.5	110	138.0	6	6
56.0	D	10	2297	2537	2777	3017	5.5	110	138.0	6	6
68.0	D	5	5040	5240	5440	5640	7.0	140	175.0	6	6
68.0	D	10	2298	2538	2778	3018	7.0	140	175.0	6	6

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°D
20 VOLTS D-C WORKING AT +85°C (Cont.)											
68.0	D	20	2299	2539	2779	3019	7.0	140	175.0	6	6
82.0	D	5	5041	5241	5441	5641	8.0	160	200.0	6	6
82.0	D	10	2300	2540	2780	3020	8.0	160	200.0	6	6
100.0	D	5	5042	5242	5442	5642	10.0	200	250.0	8	8
100.0	D	10	2301	2541	2781	3021	10.0	200	250.0	8	8
100.0	D	20	2302	2542	2782	3022	10.0	200	250.0	8	8
35 VOLTS D-C WORKING AT +85°C											
5.6	B	5	5043	5243	5443	5643	1.3	25	32.0	4	4
5.6	B	10	2303	2543	2783	3023	1.3	25	32.0	4	4
6.8	B	5	5044	5244	5444	5644	1.5	30	38.0	6	6
6.8	B	10	2304	2544	2784	3024	1.5	30	38.0	6	6
6.8	B	20	2305	2545	2785	3025	1.5	30	38.0	6	6
22.0	C	5	5045	5245	5445	5645	4.0	80	100.0	6	6
22.0	C	10	2306	2546	2786	3026	4.0	80	100.0	6	6
22.0	C	20	2307	2547	2787	3027	4.0	80	100.0	6	6
27.0	D	5	5046	5246	5446	5646	4.5	90	113.0	6	6
27.0	D	10	2308	2548	2788	3028	4.5	90	113.0	6	6
33.0	D	5	5047	5247	5447	5647	5.5	110	138.0	6	6
33.0	D	10	2309	2549	2789	3029	5.5	110	138.0	6	6
33.0	D	20	2310	2550	2790	3030	5.5	110	138.0	6	6
39.0	D	5	5048	5248	5448	5648	7.0	140	175.0	6	6
39.0	D	10	2311	2551	2791	3031	7.0	140	175.0	6	6
47.0	D	5	5049	5249	5449	5649	8.0	160	200.0	6	6
47.0	D	10	2312	2552	2792	3032	8.0	160	200.0	6	6
47.0	D	20	2313	2553	2793	3033	8.0	160	200.0	6	6
50 VOLTS D-C WORKING AT +85°C											
0.0047	A	5	5050	5250	5450	5650	0.3	5	6.3	2	4
0.0047	A	10	2314	2554	2794	3034	0.3	5	6.3	2	4
0.0047	A	20	2315	2555	2795	3035	0.3	5	6.3	2	4
0.0056	A	5	5051	5251	5451	5651	0.3	5	6.3	2	4
0.0056	A	10	2316	2556	2796	3036	0.3	5	6.3	2	4
0.0068	A	5	5052	5252	5452	5652	0.3	5	6.3	2	4
0.0068	A	10	2317	2557	2797	3037	0.3	5	6.3	2	4
0.0068	A	20	2318	2558	2798	3038	0.3	5	6.3	2	4
0.0082	A	5	5053	5253	5453	5653	0.3	5	6.3	2	4
0.0082	A	10	2319	2559	2799	3039	0.3	5	6.3	2	4
0.01	A	5	5054	5254	5454	5654	0.3	5	6.3	2	4
0.01	A	10	2320	2560	2800	3040	0.3	5	6.3	2	4
0.01	A	20	2321	2561	2801	3041	0.3	5	6.3	2	4
0.012	A	5	5055	5255	5455	5655	0.3	5	6.3	2	4
0.012	A	10	2322	2562	2802	3042	0.3	5	6.3	2	4
0.015	A	5	5056	5256	5456	5656	0.3	5	6.3	2	4
0.015	A	10	2323	2563	2803	3043	0.3	5	6.3	2	4
0.015	A	20	2324	2564	2804	3044	0.3	5	6.3	2	4
0.018	A	5	5057	5257	5457	5657	0.3	5	6.3	2	4
0.018	A	10	2325	2565	2805	3045	0.3	5	6.3	2	4
0.022	A	5	5058	5258	5458	5658	0.3	5	6.3	2	4
0.022	A	10	2326	2566	2806	3046	0.3	5	6.3	2	4
0.022	A	20	2327	2567	2807	3047	0.3	5	6.3	2	4

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

			Part No. M39003/01- Failure Rate Level (%/1000 hr.)				Max. D-C Leakage in µA @			Max. % Dissipation Factor @	
µF	Case Code	Cap. Tol. ±%	M 1.0	P 0.1	R 0.01	S 0.001	+25°C	+85°C	+125°C	−55°C/+25°C	+85°C/+125°C
50 VOLTS D-C WORKING AT +85°C - (Cont.)											
0.027	A	5	5059	5259	5459	5659	0.3	5	6.3	2	4
0.027	A	10	2328	2568	2808	3048	0.3	5	6.3	2	4
0.033	A	5	5060	5260	5460	5660	0.3	5	6.3	2	4
0.033	A	10	2329	2569	2809	3049	0.3	5	6.3	2	4
0.033	A	20	2330	2570	2810	3050	0.3	5	6.3	2	4
0.039	A	5	5061	5261	5461	5661	0.3	5	6.3	2	4
0.039	A	10	2331	2571	2811	3051	0.3	5	6.3	2	4
0.047	A	5	5062	5262	5462	5662	0.3	5	6.3	2	4
0.047	A	10	2332	2572	2812	3052	0.3	5	6.3	2	4
0.047	A	20	2333	2573	2813	3053	0.3	5	6.3	2	4
0.056	A	5	5063	5263	5463	5663	0.3	5	6.3	2	4
0.056	A	10	2334	2574	2814	3054	0.3	5	6.3	2	4
0.068	A	5	5064	5264	5464	5664	0.3	5	6.3	2	4
0.068	A	10	2335	2575	2815	3055	0.3	5	6.3	2	4
0.068	A	20	2336	2576	2816	3056	0.3	5	6.3	2	4
0.082	A	5	5065	5265	5465	5665	0.3	5	6.3	2	4
0.082	A	10	2337	2577	2817	3057	0.3	5	6.3	2	4
0.1	A	5	5066	5266	5466	5666	0.3	5	6.3	2	4
0.1	A	10	2338	2578	2818	3058	0.3	5	6.3	2	4
0.1	A	20	2339	2579	3819	3059	0.3	5	6.3	2	4
0.12	A	5	5067	5267	5467	5667	0.3	5	6.3	2	4
0.12	A	10	2340	2580	2820	3060	0.3	5	6.3	2	4
0.15	A	5	5068	5268	5468	5668	0.3	5	6.3	2	4
0.15	A	10	2341	2581	2821	3061	0.3	5	6.3	2	4
0.15	A	20	2342	2582	2822	3062	0.3	5	6.3	2	4
0.18	A	5	5069	5269	5469	5669	0.3	5	6.3	2	4
0.18	A	10	2343	2583	2823	3063	0.3	5	6.3	2	4
0.22	A	5	5070	5270	5470	5670	0.3	5	6.3	2	4
0.22	A	10	2344	2584	2824	3064	0.3	5	6.3	2	4
0.22	A	20	2345	2585	2825	3065	0.3	5	6.3	2	4
0.27	A	5	5071	5271	5471	5671	0.3	5	6.3	2	4
0.27	A	10	2346	2586	2826	3066	0.3	5	6.3	2	4
0.33	A	5	5072	5272	5472	5672	0.3	5	6.3	2	4
0.33	A	10	2347	2587	2827	3067	0.3	5	6.3	2	4
0.33	A	20	2348	2588	2828	3068	0.3	5	6.3	2	4
0.39	A	5	5073	5273	5473	5673	0.3	5	6.3	2	4
0.39	A	10	2349	2589	2829	3069	0.3	5	6.3	2	4
0.47	A	5	5074	5274	5474	5674	0.3	5	6.3	2	4
0.47	A	10	2350	2590	2830	3070	0.3	5	6.3	2	4
0.47	A	20	2351	2591	2831	3071	0.3	5	6.3	2	4
0.56	A	5	5075	5275	5475	5675	0.3	5	6.3	2	4
0.56	A	10	2352	2592	2832	3072	0.3	5	6.3	2	4
0.68	A	5	5076	5276	5476	5676	0.3	5	6.3	2	4
0.68	A	10	2353	2593	2833	3073	0.3	5	6.3	2	4
0.68	A	20	2354	2594	2834	3074	0.3	5	6.3	2	4
0.82	A	5	5077	5277	5477	5677	0.3	5	6.3	2	4
0.82	A	10	2355	2595	2835	3075	0.3	5	6.3	2	4
1.0	A	5	5078	5278	5478	5678	0.4	8	10.0	2	4
1.0	A	10	2356	2596	2836	3076	0.4	8	10.0	2	4
1.0	A	20	2357	2597	2837	3077	0.4	8	10.0	2	4

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

µF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in µA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
50 VOLTS D-C WORKING AT +85°C - (Cont.)											
1.2	B	5	5079	5279	5479	5679	0.4	9	11.0	4	4
1.2	B	10	2358	2598	2838	3078	0.4	9	11.0	4	4
1.5	B	5	5080	5280	5480	5680	0.6	12	15.0	4	4
1.5	B	10	2359	2599	2839	3079	0.6	12	15.0	4	4
1.5	B	20	2360	2600	2840	3080	0.6	12	15.0	4	4
1.8	B	5	5081	5281	5481	5681	0.7	14	18.0	4	4
1.8	B	10	2361	2601	2841	3081	0.7	14	18.0	4	4
2.2	B	5	5082	5282	5482	5682	0.8	17	22.0	4	4
2.2	B	10	2362	2602	2842	3082	0.8	17	22.0	4	4
2.2	B	20	2363	2603	2843	3083	0.8	17	22.0	4	4
2.7	B	5	5083	5283	5483	5683	1.0	20	25.0	4	4
2.7	B	10	2364	2604	2844	3084	1.0	20	25.0	4	4
3.3	B	5	5084	5284	5484	5684	1.2	25	32.0	4	4
3.3	B	10	2365	2605	2845	3085	1.2	25	32.0	4	4
3.3	B	20	2366	2606	2846	3086	1.2	25	32.0	4	4
3.9	B	5	5085	5285	5485	5685	1.5	30	38.0	4	4
3.9	B	10	2367	2607	2847	3087	1.5	30	38.0	4	4
4.7	B	5	5086	5286	5486	5686	1.7	35	44.0	4	4
4.7	B	10	2368	2608	2848	3088	1.7	35	44.0	4	4
4.7	B	20	2369	2609	2849	3089	1.7	35	44.0	4	4
5.6	C	5	5087	5287	5487	5687	2.2	45	56.0	4	4
5.6	C	10	2370	2610	2850	3090	2.2	45	56.0	4	4
6.8	C	5	5088	5288	5488	5688	2.2	45	56.0	6	6
6.8	C	10	2371	2611	2851	3091	2.2	45	56.0	6	6
6.8	C	20	2372	2612	2852	3092	2.2	45	56.0	6	6
8.2	C	5	5089	5289	5489	5689	2.5	50	63.0	6	6
8.2	C	10	2373	2613	2853	3093	2.5	50	63.0	6	6
10.0	C	5	5090	5290	5490	5690	2.5	50	63.0	6	6
10.0	C	10	2374	2614	2854	3094	2.5	50	63.0	6	6
10.0	C	20	2375	2615	2855	3095	2.5	50	63.0	6	6
12.0	C	5	5091	5291	5491	5691	3.0	60	75.0	6	6
12.0	C	10	2376	2616	2856	3096	3.0	60	75.0	6	6
15.0	C	5	5092	5292	5492	5692	4.0	80	100.0	6	6
15.0	C	10	2377	2617	2857	3097	4.0	80	100.0	6	6
15.0	C	20	2378	2618	2858	3098	4.0	80	100.0	6	6
18.0	C	5	5093	5293	5493	5693	4.5	90	113.0	6	6
18.0	C	10	2379	2619	2859	3099	4.5	90	113.0	6	6
22.0	D	5	5094	5294	5494	5694	5.5	110	138.0	6	6
22.0	D	10	2380	2620	2860	3100	5.5	110	138.0	6	6
22.0	D	20	2381	2621	2861	3101	5.5	110	138.0	6	6
75 VOLTS D-C WORKING AT +85°C											
0.1	A	5	5095	5295	5495	5695	0.3	5	6.3	2	4
0.1	A	10	2382	2622	2862	3102	0.3	5	6.3	2	4
0.1	A	20	2383	2623	2863	3103	0.3	5	6.3	2	4
0.12	A	5	5096	5296	5496	5696	0.3	5	6.3	2	4
0.12	A	10	2384	2624	2864	3104	0.3	5	6.3	2	4
0.15	A	5	5097	5297	5497	5697	0.3	5	6.3	2	4
0.15	A	10	2385	2625	2865	3105	0.3	5	6.3	2	4
0.15	A	20	2386	2626	2866	3106	0.3	5	6.3	2	4
0.18	A	5	5098	5298	5498	5698	0.3	5	6.3	2	4
0.18	A	10	2387	2627	2867	3107	0.3	5	6.3	2	4

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

			Part No. M39003/01- Failure Rate Level (%/1000 hr.)				Max. D-C Leakage in μA @			Max. % Dissipation Factor @	
μF	Case Code	Cap. Tol. ±%	M 1.0	P 0.1	R 0.01	S 0.001	+25°C	+85°C	+125°C	−55°C/+25°C	+85°C/+125°C
						75 VOLTS D-C WORKING AT +85°C - (Cont.)					
0.22	A	5	5099	5299	5499	5699	0.3	5	6.3	2	4
0.22	A	10	2388	2628	2868	3108	0.3	5	6.3	2	4
0.22	A	20	2389	2629	2869	3109	0.3	5	6.3	2	4
0.27	A	5	5100	5300	5500	5700	0.3	5	6.3	2	4
0.27	A	10	2390	2630	2870	3110	0.3	5	6.3	2	4
0.33	A	5	5101	5301	5501	5701	0.3	5	6.3	2	4
0.33	A	10	2391	2631	2871	3111	0.3	5	6.3	2	4
0.33	A	20	2392	2632	2872	3112	0.3	5	6.3	2	4
0.39	A	5	5102	5302	5502	5702	0.3	5	6.3	2	4
0.39	A	10	2393	2633	2873	3113	0.3	5	6.3	2	4
0.47	A	5	5103	5303	5503	5703	0.3	5	6.3	2	4
0.47	A	10	2394	2634	2874	3114	0.3	5	6.3	2	4
0.47	A	20	2395	2635	2875	3115	0.3	5	6.3	2	4
0.56	A	5	5104	5304	5504	5704	0.3	5	6.3	2	4
0.56	A	10	2396	2636	2876	3116	0.3	5	6.3	2	4
0.68	A	5	5105	5305	5505	5705	0.3	5	6.3	2	4
0.68	A	10	2397	2637	2877	3117	0.3	5	6.3	2	4
0.68	A	20	2398	2638	2878	3118	0.3	5	6.3	2	4
0.82	B	5	5106	5306	5506	5706	0.3	5	6.3	2	4
0.82	B	10	2399	2639	2879	3119	0.3	5	6.3	2	4
1.0	B	5	5107	5307	5507	5707	0.4	5	6.3	2	4
1.0	B	10	2400	2640	2880	3120	0.4	5	6.3	2	4
1.0	B	20	2401	2641	2881	3121	0.4	5	6.3	2	4
1.2	B	5	5108	5308	5508	5708	0.4	5	6.3	4	4
1.2	B	10	2402	2642	2882	3122	0.4	5	6.3	4	4
1.5	B	5	5109	5309	5509	5709	0.6	10	13.0	4	4
1.5	B	10	2403	2643	2883	3123	0.6	10	13.0	4	4
1.5	B	20	2404	2644	2884	3124	0.6	10	13.0	4	4
1.8	B	5	5110	5310	5510	5710	0.7	10	13.0	4	4
1.8	B	10	2405	2645	2885	3125	0.7	10	13.0	4	4
2.2	B	5	5111	5311	5511	5711	0.8	15	19.0	4	4
2.2	B	10	2406	2646	2886	3126	0.8	15	19.0	4	4
2.2	B	20	2407	2647	2887	3127	0.8	15	19.0	4	4
2.7	B	5	5112	5312	5512	5712	1.0	15	19.0	4	4
2.7	B	10	2408	2648	2888	3128	1.0	15	19.0	4	4
3.3	B	5	5113	5313	5513	5713	1.2	20	25.0	4	4
3.3	B	10	2409	2649	2889	3129	1.2	20	25.0	4	4
3.3	B	20	2410	2650	2890	3130	1.2	20	25.0	4	4
3.9	B	5	5114	5314	5514	5714	1.5	20	25.0	4	4
3.9	B	10	2411	2651	2891	3131	1.5	20	25.0	4	4
4.7	C	5	5115	5315	5515	5715	3.0	60	75.0	4	4
4.7	C	10	2412	2652	2892	3132	3.0	60	75.0	4	4
4.7	C	20	2413	2653	2893	3133	3.0	60	75.0	4	4
5.6	C	5	5116	5316	5516	5716	3.0	60	75.0	4	4
5.6	C	10	2414	2654	2894	3134	3.0	60	75.0	4	4
6.8	C	5	5117	5317	5517	5717	5.0	100	125.0	6	6
6.8	C	10	2415	2655	2895	3135	5.0	100	125.0	6	6
6.8	C	20	2416	2656	2896	3136	5.0	100	125.0	6	6
8.2	C	5	5118	5318	5518	5718	5.0	100	125.0	6	6
8.2	C	10	2417	2657	2897	3137	5.0	100	125.0	6	6

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
75 VOLTS D-C WORKING AT +85°C - (Cont.)											
10.0	C	5	5119	5319	5519	5719	5.0	100	125.0	6	6
10.0	C	10	2418	2658	2898	3138	5.0	100	125.0	6	6
10.0	C	20	2419	2659	2899	3139	5.0	100	125.0	6	6
12.0	D	5	5120	5320	5520	5720	5.0	100	125.0	6	6
12.0	D	10	2420	2660	2900	3140	5.0	100	125.0	6	6
15.0	D	5	5121	5321	5521	5721	7.0	140	175.0	6	6
15.0	D	10	2421	2661	2901	3141	7.0	140	175.0	6	6
15.0	D	20	2422	2662	2902	3142	7.0	140	175.0	6	6
100 VOLTS D-C WORKING AT +85°C											
0.0047	A	5	5122	5322	5522	5722	0.3	5	6.3	2	4
0.0047	A	10	2423	2663	2093	3143	0.3	5	6.3	2	4
0.0047	A	20	2424	2664	2094	3144	0.3	5	6.3	2	4
0.0056	A	5	5123	5323	5523	5723	0.3	5	6.3	2	4
0.0056	A	10	2425	2665	2095	3145	0.3	5	6.3	2	4
0.0068	A	5	5124	5324	5524	5724	0.3	5	6.3	2	4
0.0068	A	10	2426	2666	2906	3146	0.3	5	6.3	2	4
0.0068	A	20	2427	2667	2907	3147	0.3	5	6.3	2	4
0.0082	A	5	5125	5325	5525	5725	0.3	5	6.3	2	4
0.0082	A	10	2428	2668	2908	3148	0.3	5	6.3	2	4
0.01	A	5	5126	5326	5526	5726	0.3	5	6.3	2	4
0.01	A	10	2429	2669	2909	3149	0.3	5	6.3	2	4
0.01	A	20	2430	2670	2910	3150	0.3	5	6.3	2	4
0.012	A	5	5127	5327	5527	5727	0.3	5	6.3	2	4
0.012	A	10	2431	2671	2911	3151	0.3	5	6.3	2	4
0.015	A	5	5128	5328	5528	5728	0.3	5	6.3	2	4
0.015	A	10	2432	2672	2912	3152	0.3	5	6.3	2	4
0.015	A	20	2433	2673	2913	3153	0.3	5	6.3	2	4
0.018	A	5	5129	5329	5529	5729	0.3	5	6.3	2	4
0.018	A	10	2434	2674	2914	3154	0.3	5	6.3	2	4
0.022	A	5	5130	5330	5530	5730	0.3	5	6.3	2	4
0.022	A	10	2435	2675	2915	3155	0.3	5	6.3	2	4
0.022	A	20	2436	2676	2916	3156	0.3	5	6.3	2	4
0.027	A	5	5131	5331	5531	5731	0.3	5	6.3	2	4
0.027	A	10	2437	2677	2917	3157	0.3	5	6.3	2	4
0.033	A	5	5132	5332	5532	5732	0.3	5	6.3	2	4
0.033	A	10	2438	2678	2918	3158	0.3	5	6.3	2	4
0.033	A	20	2439	2679	2919	3159	0.3	5	6.3	2	4
0.039	A	5	5133	5333	5533	5733	0.3	5	6.3	2	4
0.039	A	10	2440	2680	2920	3160	0.3	5	6.3	2	4
0.047	A	5	5134	5334	5534	5734	0.3	5	6.3	2	4
0.047	A	10	2441	2681	2921	3161	0.3	5	6.3	2	4
0.047	A	20	2442	2682	2922	3162	0.3	5	6.3	2	4
0.056	A	5	5135	5335	5535	5735	0.3	5	6.3	2	4
0.056	A	10	2443	2683	2923	3163	0.3	5	6.3	2	4
0.068	A	5	5136	5336	5536	5736	0.3	5	6.3	2	4
0.068	A	10	2444	2684	2924	3164	0.3	5	6.3	2	4
0.068	A	20	2445	2685	2925	3165	0.3	5	6.3	2	4
0.082	A	5	5137	5337	5537	5737	0.3	5	6.3	2	4
0.082	A	10	2446	2686	2926	3166	0.3	5	6.3	2	4
0.1	A	5	5138	5338	5538	5738	0.3	5	6.3	2	4
0.1	A	10	2447	2687	2927	3167	0.3	5	6.3	2	4
0.1	A	20	2448	2688	2928	3168	0.3	5	6.3	2	4

STYLE CSR13 - (Cont.)
PART NUMBER M39003/01-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/01- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
100 VOLTS D-C WORKING AT +85°C - (Cont.)											
0.12	A	5	5139	5339	5539	5739	0.3	5	6.3	2	4
0.12	A	10	2449	2689	2929	3169	0.3	5	6.3	2	4
0.15	A	5	5140	5340	5540	5740	0.3	5	6.3	2	4
0.15	A	10	2450	2690	2930	3170	0.3	5	6.3	2	4
0.15	A	20	2451	2691	2931	3171	0.3	5	6.3	2	4
0.18	A	5	5141	5341	5541	5741	0.3	5	6.3	2	4
0.18	A	10	2452	2692	2932	3172	0.3	5	6.3	2	4
0.22	A	5	5142	5342	5542	5742	0.3	5	6.3	2	4
0.22	A	10	2453	2693	2933	3173	0.3	5	6.3	2	4
0.22	A	20	2454	2694	2934	3174	0.3	5	6.3	2	4
0.27	A	5	5143	5343	5543	5743	0.3	5	6.3	2	4
0.27	A	10	2455	2695	2935	3175	0.3	5	6.3	2	4
0.33	A	5	5144	5344	5544	5744	0.3	5	6.3	2	4
0.33	A	10	2456	2696	2936	3176	0.3	5	6.3	2	4
0.33	A	20	2457	2697	2937	3177	0.3	5	6.3	2	4
0.39	A	5	5145	5345	5545	5745	0.3	5	6.3	2	4
0.39	A	10	2458	2698	2938	3178	0.3	5	6.3	2	4
0.47	A	5	5146	5346	5546	5746	0.3	5	6.3	2	4
0.47	A	10	2459	2699	2939	3179	0.3	5	6.3	2	4
0.47	A	20	2460	2700	2940	3180	0.3	5	6.3	2	4
0.56	A	5	5147	5347	5547	5747	0.3	5	6.3	2	4
0.56	A	10	2461	2701	2941	3181	0.3	5	6.3	2	4
0.68	B	5	5148	5348	5548	5748	0.3	5	6.3	2	4
0.68	B	10	2462	2702	2942	3182	0.3	5	6.3	2	4
0.68	B	20	2463	2703	2943	3183	0.3	5	6.3	2	4
0.82	B	5	5149	5349	5549	5749	0.4	5	6.3	2	4
0.82	B	10	2464	2704	2944	3184	0.4	5	6.3	2	4
1.0	B	5	5150	5350	5550	5750	0.5	5	6.3	2	4
1.0	B	10	2465	2705	2945	3185	0.5	5	6.3	2	4
1.0	B	20	2466	2706	2946	3186	0.5	5	6.3	2	4
1.2	B	5	5151	5351	5551	5751	0.5	5	6.3	4	4
1.2	B	10	2467	2707	2947	3187	0.5	5	6.3	4	4
1.5	B	5	5152	5352	5552	5752	0.7	10	13.0	4	4
1.5	B	10	2468	2708	2948	3188	0.7	10	13.0	4	4
1.5	B	20	2469	2709	2949	3189	0.7	10	13.0	4	4
1.8	B	5	5153	5353	5553	5753	0.7	10	13.0	4	4
1.8	B	10	2470	2710	2950	3190	0.7	10	13.0	4	4
2.2	B	5	5154	5354	5554	5754	0.9	15	19.0	4	4
2.2	B	10	2471	2711	2951	3191	0.9	15	19.0	4	4
2.2	B	20	2472	2712	2952	3192	0.9	15	19.0	4	4
2.7	B	5	5155	5355	5555	5755	1.1	15	19.0	4	4
2.7	B	10	2473	2713	2953	3193	1.1	15	19.0	4	4
3.3	C	5	5156	5356	5556	5756	1.5	30	38.0	6	6
3.3	C	10	5157	5357	5557	5757	1.5	30	38.0	6	6
3.3	C	20	5158	5358	5558	5758	1.5	30	38.0	6	6
3.9	C	5	5159	5359	5559	5759	1.5	30	38.0	6	6
3.9	C	10	5160	5360	5560	5760	1.5	30	38.0	6	6
4.7	C	5	5161	5361	5561	5761	2.5	50	63.0	6	6
4.7	C	10	5162	5362	5562	5762	2.5	50	63.0	6	6
4.7	C	20	5163	5363	5563	5763	2.5	50	63.0	6	6
5.6	C	5	5164	5364	5564	5764	2.5	50	63.0	6	6
5.6	C	10	5165	5365	5565	5765	2.5	50	63.0	6	6
6.8	C	5	5166	5366	5566	5766	2.5	50	63.0	6	6
6.8	C	10	5167	5367	5567	5767	2.5	50	63.0	6	6
6.8	C	20	5168	5368	5568	5768	2.5	50	63.0	6	6

STYLE CSR23
PART NUMBER M39003/03-XXXX

µF	Case Code	Cap. Tol. ±%	Part No. M39003/03- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in µA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
						6 VOLTS D-C WORKING AT +85°C					
10.0	A	10	0101	0201	0301	0401	0.9	9	11.0	6	6
10.0	A	20	0102	0202	0302	0402	0.9	9	11.0	6	6
12.0	A	10	0103	0203	0303	0403	1.0	10	12.5	6	6
100.0	B	10	0104	0204	0304	0404	6.0	60	75.0	8	8
100.0	B	20	0105	0205	0305	0405	6.0	60	75.0	8	8
330.0	C	10	0106	0206	0306	0406	15.0	150	188.0	8	8
330.0	C	20	0107	0207	0307	0407	15.0	150	188.0	8	8
390.0	C	10	0108	0208	0308	0408	15.0	150	188.0	10	10
470.0	C	10	0109	0209	0309	0409	15.0	150	188.0	10	10
470.0	C	20	0110	0210	0310	0410	15.0	150	188.0	10	10
680.0	D	10	0111	0211	0311	0411	20.0	200	250.0	10	10
680.0	D	20	0112	0212	0312	0412	20.0	200	250.0	10	10
820.0	D	10	0113	0213	0313	0413	20.0	200	250.0	10	10
1000.0	D	10	0114	0214	0314	0414	30.0	300	375.0	10	10
1000.0	D	20	0115	0215	0315	0415	30.0	300	375.0	10	10
						10 VOLTS D-C WORKING AT +85°C					
6.8	A	10	0116	0216	0316	0416	1.0	10	12.5	6	6
6.8	A	20	0117	0217	0317	0417	1.0	10	12.5	6	6
8.2	A	10	0118	0218	0318	0418	1.2	12	15.0	6	6
47.0	B	10	0119	0219	0319	0419	5.0	50	63.0	6	6
47.0	B	20	0120	0220	0320	0420	5.0	50	63.0	6	6
56.0	B	10	0121	0221	0321	0421	6.0	60	75.0	6	6
68.0	B	10	0122	0222	0322	0422	7.0	70	88.0	6	6
68.0	B	20	0123	0223	0323	0423	7.0	70	88.0	6	6
82.0	B	10	0124	0224	0324	0424	8.0	80	100.0	6	6
220.0	C	10	0125	0225	0325	0425	15.0	150	188.0	8	8
220.0	C	20	0126	0226	0326	0426	15.0	150	188.0	8	8
270.0	C	10	0127	0227	0327	0427	15.0	150	188.0	8	8
390.0	D	10	0128	0228	0328	0428	20.0	200	250.0	10	10
470.0	D	10	0129	0229	0329	0429	20.0	200	250.0	10	10
470.0	D	20	0130	0230	0330	0430	20.0	200	250.0	10	10
560.0	D	10	0131	0231	0331	0431	30.0	300	375.0	10	10
						15 VOLTS D-C WORKING AT +85°C					
4.7	A	10	0132	0232	0332	0432	1.0	10	12.5	4	4
4.7	A	20	0133	0233	0333	0433	1.0	10	12.5	4	4
5.6	A	10	0134	0234	0334	0434	1.3	13	16.5	4	4
33.0	B	10	0135	0235	0335	0435	6.0	60	75.0	6	6
33.0	B	20	0136	0236	0336	0436	6.0	60	75.0	6	6
39.0	B	10	0137	0237	0337	0437	6.0	60	75.0	6	6
150.0	C	10	0138	0238	0338	0438	15.0	150	188.0	8	8
150.0	C	20	0139	0239	0339	0439	15.0	150	188.0	8	8
180.0	C	10	0140	0240	0340	0440	15.0	150	188.0	8	8
220.0	D	10	0141	0241	0341	0441	20.0	200	250.0	8	8
220.0	D	20	0142	0242	0342	0442	20.0	200	250.0	8	8
270.0	D	10	0143	0243	0343	0443	20.0	200	250.0	8	8
330.0	D	10	0144	0244	0344	0444	20.0	200	250.0	8	8
330.0	D	20	0145	0245	0345	0445	20.0	200	250.0	8	8

STYLE CSR23 - (Cont.)
PART NUMBER M39003/03-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/03- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
20 VOLTS D-C WORKING AT +85°C											
2.7	A	10	0146	0246	0346	0446	0.8	8	10.0	4	4
3.3	A	10	0147	0247	0347	0447	1.0	10	12.5	4	4
3.3	A	20	0148	0248	0348	0448	1.0	10	12.5	4	4
3.9	A	10	0149	0249	0349	0449	1.2	12	15.0	4	4
18.0	B	10	0150	0250	0350	0450	4.0	40	50.0	6	6
22.0	B	10	0151	0251	0351	0451	4.0	40	50.0	6	6
22.0	B	20	0152	0252	0352	0452	4.0	40	50.0	6	6
27.0	B	10	0153	0253	0353	0453	5.0	50	63.0	6	6
56.0	C	10	0154	0254	0354	0454	9.0	90	110.0	6	6
68.0	C	10	0155	0255	0355	0455	10.0	100	125.0	6	6
68.0	C	20	0156	0256	0356	0456	10.0	100	125.0	6	6
82.0	C	10	0157	0257	0357	0457	10.0	100	125.0	6	6
100.0	C	10	0158	0258	0358	0458	15.0	150	188.0	6	6
100.0	C	20	0159	0259	0359	0459	15.0	150	188.0	6	6
120.0	C	10	0160	0260	0360	0460	15.0	150	188.0	6	6
150.0	D	10	0161	0261	0361	0461	20.0	200	250.0	8	8
150.0	D	20	0162	0262	0362	0462	20.0	200	250.0	8	8
180.0	D	10	0163	0263	0363	0463	20.0	200	250.0	8	8
35 VOLTS D-C WORKING AT +85°C											
1.8	A	10	0164	0264	0364	0464	1.0	10	12.5	4	4
8.2	B	10	0165	0265	0365	0465	3.5	35	44.0	6	6
10.0	B	10	0166	0266	0366	0466	4.0	40	50.0	6	6
10.0	B	20	0167	0267	0367	0467	4.0	40	50.0	6	6
33.0	C	10	0168	0268	0368	0468	10.0	100	125.0	6	6
33.0	C	20	0169	0269	0369	0469	10.0	100	125.0	6	6
39.0	C	10	0170	0270	0370	0470	10.0	100	125.0	6	6
47.0	C	10	0171	0271	0371	0471	10.0	100	125.0	6	6
47.0	C	20	0172	0272	0372	0472	10.0	100	125.0	6	6
56.0	D	10	0173	0273	0373	0473	15.0	150	188.0	6	6
68.0	D	10	0174	0274	0374	0474	15.0	150	188.0	6	6
68.0	D	20	0175	0275	0375	0475	15.0	150	188.0	6	6
50 VOLTS D-C WORKING AT +85°C											
1.2	A	10	0176	0276	0376	0476	0.9	9	11.0	4	4
1.5	A	10	0177	0277	0377	0477	1.2	12	15.0	4	4
1.5	A	20	0178	0278	0378	0478	1.2	12	15.0	4	4
5.6	B	10	0179	0279	0379	0479	4.5	45	56.0	4	4
6.8	B	10	0180	0280	0380	0480	4.5	45	56.0	6	6
6.8	B	20	0181	0281	0381	0481	4.5	45	56.0	6	6
22.0	C	10	0182	0282	0382	0482	10.0	100	125.0	6	6
22.0	C	20	0183	0283	0383	0483	10.0	100	125.0	6	6
27.0	C	10	0184	0284	0384	0484	10.0	100	125.0	6	6
33.0	D	10	0185	0285	0385	0485	10.0	100	125.0	6	6
33.0	D	20	0186	0286	0386	0486	10.0	100	125.0	6	6
39.0	D	10	0187	0287	0387	0487	10.0	100	125.0	6	6

STYLE CSR33
PART NUMBER M39003/06-XXXX

μF	Case Code	Cap. Tol. ±%	Part No. M39003/06- Failure Rate Level (%/1000 hr.) M 1.0	P 0.1	R 0.01	S 0.001	Max. D-C Leakage in μA @ +25°C	+85°C	+125°C	Max. % Dissipation Factor @ −55°C/+25°C	+85°C/+125°C
					6 VOLTS D-C WORKING AT +85°C						
10.0	A	10	0001	0101	0201	0301	0.5	2.0	2.0	6	6
10.0	A	20	0002	0102	0202	0302	0.5	2.0	2.0	6	6
12.0	A	10	0003	0103	0203	0303	0.5	2.0	2.0	6	6
100.0	B	10	0004	0104	0204	0304	1.0	3.0	3.0	8	8
100.0	B	20	0005	0105	0205	0305	1.0	3.0	3.0	8	8
330.0	C	10	0006	0106	0206	0306	2.0	8.0	8.0	8	8
330.0	C	20	0007	0107	0207	0307	2.0	8.0	8.0	8	8
390.0	C	10	0008	0108	0208	0308	2.0	8.0	8.0	10	10
470.0	C	10	0009	0109	0209	0309	2.0	8.0	8.0	10	10
470.0	C	20	0010	0110	0210	0310	2.0	8.0	8.0	10	10
680.0	D	10	0011	0111	0211	0311	5.0	10.0	10.0	10	10
680.0	D	20	0012	0112	0212	0312	5.0	10.0	10.0	10	10
820.0	D	10	0013	0113	0213	0313	5.0	10.0	10.0	10	10
1000.0	D	10	0014	0114	0214	0314	5.0	10.0	10.0	10	10
1000.0	D	20	0015	0115	0215	0315	5.0	10.0	10.0	10	10
					10 VOLTS D-C WORKING AT +85°C						
6.8	A	10	0016	0116	0216	0316	0.5	2.0	2.0	6	6
6.8	A	20	0017	0117	0217	0317	0.5	2.0	2.0	6	6
8.2	A	10	0018	0118	0218	0318	0.5	2.0	2.0	6	6
47.0	B	10	0019	0119	0219	0319	1.0	2.0	2.0	6	6
47.0	B	20	0020	0120	0220	0320	1.0	2.0	2.0	6	6
56.0	B	10	0021	0121	0221	0321	1.0	4.0	4.0	6	6
68.0	B	10	0022	0122	0222	0322	1.0	4.0	4.0	6	6
68.0	B	20	0023	0123	0223	0323	1.0	4.0	4.0	6	6
82.0	B	10	0024	0124	0224	0324	1.0	4.0	4.0	6	6
220.0	C	10	0025	0125	0225	0325	1.0	7.0	7.0	8	8
220.0	C	20	0026	0126	0226	0326	1.0	7.0	7.0	8	8
270.0	C	10	0027	0127	0227	0327	2.0	10.0	10.0	8	8
390.0	D	10	0028	0128	0228	0328	2.0	16.0	16.0	10	10
470.0	D	10	0029	0129	0229	0329	4.0	16.0	16.0	10	10
470.0	D	20	0030	0130	0230	0330	4.0	16.0	16.0	10	10
560.0	D	10	0031	0131	0231	0331	4.0	16.0	16.0	10	10
					15 VOLTS D-C WORKING AT +85°C						
4.7	A	10	0032	0132	0232	0332	0.5	2.0	2.0	4	4
4.7	A	20	0033	0133	0233	0333	0.5	2.0	2.0	4	4
5.6	A	10	0034	0134	0234	0334	0.5	2.0	2.0	4	4
33.0	B	10	0035	0135	0235	0335	1.0	2.0	2.0	6	6
33.0	B	20	0036	0136	0236	0336	1.0	2.0	2.0	6	6
39.0	B	10	0037	0137	0237	0337	1.0	2.0	2.0	6	6
150.0	C	10	0038	0138	0238	0338	1.0	7.0	7.0	8	8
150.0	C	20	0039	0139	0239	0339	1.0	7.0	7.0	8	8
180.0	C	10	0040	0140	0240	0340	2.0	10.0	10.0	8	8
220.0	D	10	0041	0141	0241	0341	2.0	10.0	10.0	8	8
220.0	D	20	0042	0142	0242	0342	2.0	10.0	10.0	8	8
270.0	D	10	0043	0143	0243	0343	2.0	16.0	16.0	8	8
330.0	D	10	0044	0144	0244	0344	2.0	16.0	16.0	8	8
330.0	D	20	0045	0145	0245	0345	2.0	16.0	16.0	8	8

STYLE CSR33 - (Cont.)
PART NUMBER M39003/06-XXXX

			Part No. M39003/06- Failure Rate Level (%/1000 hr.)				Max. D-C Leakage in μA @			Max. % Dissipation Factor @	
	Case	Cap. Tol.	M	P	R	S					
μF	Code	±%	1.0	0.1	0.01	0.001	+25°C	+85°C	+125°C	−55°C/+25°C	+85°C/+125°C
20 VOLTS D-C WORKING AT +85°C											
2.7	A	10	0046	0146	0246	0346	0.5	2.0	2.0	4	4
3.3	A	10	0047	0147	0247	0347	0.5	2.0	2.0	4	4
3.3	A	20	0048	0148	0248	0348	0.5	2.0	2.0	4	4
3.9	A	10	0049	0149	0249	0349	0.5	2.0	2.0	4	4
18.0	B	10	0050	0150	0250	0350	1.0	2.0	2.0	6	6
22.0	B	10	0051	0151	0251	0351	1.0	2.0	2.0	6	6
22.0	B	20	0052	0152	0252	0352	1.0	2.0	2.0	6	6
27.0	B	10	0053	0153	0253	0353	1.0	2.0	2.0	6	6
56.0	C	10	0054	0154	0254	0354	1.0	10.0	10.0	6	6
68.0	C	10	0055	0155	0255	0355	1.0	10.0	10.0	6	6
68.0	C	20	0056	0156	0256	0356	1.0	10.0	10.0	6	6
82.0	C	10	0057	0157	0257	0357	1.0	10.0	10.0	6	6
100.0	C	10	0058	0158	0258	0358	1.0	10.0	10.0	6	6
100.0	C	20	0059	0159	0259	0359	1.0	10.0	10.0	6	6
120.0	C	10	0060	0160	0260	0360	1.0	10.0	10.0	6	6
150.0	D	10	0061	0161	0261	0361	2.0	10.0	10.0	8	8
150.0	D	20	0062	0162	0262	0362	2.0	10.0	10.0	8	8
180.0	D	10	0063	0163	0263	0363	2.0	10.0	10.0	8	8
35 VOLTS D-C WORKING AT +85°C											
1.8	A	10	0064	0164	0264	0364	0.5	2.0	2.0	4	4
8.2	B	10	0065	0165	0265	0365	1.0	2.0	2.0	6	6
10.0	B	10	0066	0166	0266	0366	1.0	2.0	2.0	6	6
10.0	B	20	0067	0167	0267	0367	1.0	2.0	2.0	6	6
33.0	C	10	0068	0168	0268	0368	1.0	5.0	5.0	6	6
33.0	C	20	0069	0169	0269	0369	1.0	5.0	5.0	6	6
39.0	C	10	0070	0170	0270	0370	1.0	5.0	5.0	6	6
47.0	C	10	0071	0171	0271	0371	1.0	5.0	5.0	6	6
47.0	C	20	0072	0172	0272	0372	1.0	5.0	5.0	6	6
56.0	D	10	0073	0173	0273	0373	2.0	10.0	10.0	6	6
68.0	D	10	0074	0174	0274	0374	2.0	10.0	10.0	6	6
68.0	D	20	0075	0175	0275	0375	2.0	10.0	10.0	6	6
50 VOLTS D-C WORKING AT +85°C											
1.2	A	10	0076	0176	0276	0376	0.5	2.0	2.0	4	4
1.5	A	10	0077	0177	0277	0377	0.5	2.0	2.0	4	4
1.5	A	20	0078	0178	0278	0378	0.5	2.0	2.0	4	4
5.6	B	10	0079	0179	0279	0379	1.0	2.0	2.0	4	4
6.8	B	10	0080	0180	0280	0380	1.0	2.0	2.0	6	6
6.8	B	20	0081	0181	0281	0381	1.0	2.0	2.0	6	6
22.0	C	10	0082	0182	0282	0382	1.0	5.0	5.0	6	6
22.0	C	20	0083	0183	0283	0383	1.0	5.0	5.0	6	6
27.0	C	10	0084	0184	0284	0384	1.0	5.0	5.0	6	6
33.0	D	10	0085	0185	0285	0385	1.0	9.0	9.0	6	6
33.0	D	20	0086	0186	0286	0386	1.0	9.0	9.0	6	6
39.0	D	10	0087	0187	0287	0387	1.0	9.0	9.0	6	6

In the construction of the components described, the full intent of the specification will be met. The Sprague Electric Company, however, reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

The information included herein is believed to be accurate and reliable. However, the Sprague Electric Company assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

SPRAGUE® THE MARK OF RELIABILITY

a Penn Central unit

Engineering Bulletin

3760.2

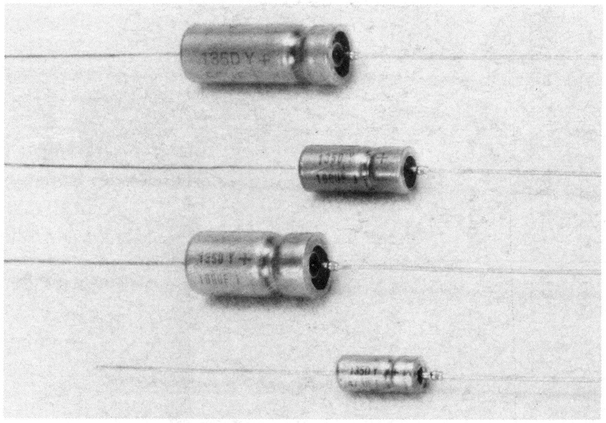
Type 135D

Tantalum-Case Tantalum Capacitors

Certified to IECQ-System Specification QC300202US0001

The first electronic components qualified under the worldwide quality certification program of the International Electrotechnical Commission Quality Assessment System are Sprague Type 135D axial-lead, tantalum-case tantalum capacitors.

Catalog numbers for parts made to this specification are shown in the Standard Ratings Table on Page 2. Because it is not readily available to many prospective users, the complete specification is included in this bulletin.



9743

Catalog Numbering System

ALWAYS SPECIFY BY COMPLETE CATALOG NUMBER, SUCH AS:

135D Y 686 M 6R3 A 2

- **2** — **STYLE.** 2 = INSULATING SLEEVE
- **A** — **CASE CODE.** SEE TABLE 1.
- **6R3** — **VOLTAGE RATINGS.** D-C WORKING VOLTAGE AT +85°C EXPRESSED IN VOLTS. AN 'R' IS BE USED TO INDICATE A DECIMAL POINT (6R3 = 6.3 VOLTS). WHERE NECESSARY, ZEROS PRECEDE THE VOLTAGE TO COMPLETE THE 3-DIGIT BLOCK.
- **M** — **CAPACITANCE TOLERANCE.** M = ±20%, K = ±10%, J = ± 5%
- **686** — **CAPACITANCE.** IN PICOFARADS. THE FIRST 2 DIGITS ARE SIGNIFICANT, THE THIRD IS THE NUMBER OF ZEROS.
- **Y** — IDENTIFIES TYPE 135D CAPACITORS CERTIFIED TO IECQ-SYSTEM SPECIFICATION QC300202US0001.
- **135D** — **SPRAGUE TYPE NUMBER.** THIS IDENTIFIES THE BASIC CAPACITOR DESIGN.

STANDARD RATINGS

WVDC +85°C	WVDC +125°C	C_R µF	Catalog Number Cap. Tol. ±20%	Catalog Number Cap. Tol. ±10%	Catalog Number Cap. Tol. ±5%
6.3	4	68	135DY686M6R3A2	135DY686K6R3A2	135DY686J6R3A2
6.3	4	270	135DY277M6R3B2	135DY277K6R3B2	135DY277J6R3B2
6.3	4	560	135DY567M6R3C2	135DY567K6R3C2	135DY567J6R3C2
6.3	4	1200	135DY128M6R3D2	135DY128K6R3D2	135DY128J6R3D2
10	6.3	47	135DY476M010A2	135DY476K010A2	135DY476J010A2
10	6.3	180	135DY187M010B2	135DY187K010B2	135DY187J010B2
10	6.3	390	135DY397M010C2	135DY397K010C2	135DY397J010C2
10	6.3	820	135DY827M010D2	135DY827K010D2	135DY827J010D2
16	10	33	135DY336M016A2	135DY336K016A2	135DY336J016A2
16	10	120	135DY127M016B2	135DY127K016B2	135DY127J016B2
16	10	270	135DY277M016C2	135DY277K016C2	135DY277J016C2
16	10	560	135DY567M016D2	135DY567K016D2	135DY567J016D2
25	16	22	135DY226M025A2	135DY226K025A2	135DY226J025A2
25	16	100	135DY107M025B2	135DY107K025B2	135DY107J025B2
25	16	180	135DY187M025C2	135DY187K025C2	135DY187J025C2
25	16	390	135DY397M025D2	135DY397K025D2	135DY397J025D2
40	25	12	135DY126M040A2	135DY126K040A2	135DY126J040A2
40	25	56	135DY566M040B2	135DY566K040B2	135DY566J040B2
40	25	100	135DY107M040C2	135DY107K040C2	135DY107J040C2
40	25	220	135DY227M040D2	135DY227K040D2	135DY227J040D2
63	40	8.2	135DY825M063A2	135DY825K063A2	135DY825J063A2
63	40	39	135DY396M063B2	135DY396K063B2	135DY396J063B2
63	40	68	135DY686M063C2	135DY686K063C2	135DY686J063C2
63	40	150	135DY157M063D2	135DY157M063D2	135DY157J063D2
80	50	6.8	135DY685M080A2	135DY685K080A2	135DY685J080A2
80	50	33	135DY336M080B2	135DY336K080B2	135DY336J090B2
80	50	56	135DY566M080C2	135DY566K080C2	135DY566J080C2
80	50	100	135DY107M080D2	135DY107K080D2	135DY107J080D2
100	63	4.7	135DY475M100A2	135DY475K100A2	135DY475J100A2
100	63	22	135DY226M100B2	135DY226K100B2	135DY226J100B2
100	63	47	135DY476M100C2	135DY476K100C2	135DY476J100C2
100	63	82	135DY826M100D2	135DY826K100D2	135DY826J100D2
125	80	3.9	135DY395M125A2	135DY395K125A2	135DY395J125A2
125	80	15	135DY156M125B2	135DY156K125B2	135DY156J125B2
125	80	27	135DY276M125C2	135DY276K125C2	135DY276J125C2
125	80	56	135DY566M125D2	135DY566K125D2	135DY566J125D2

Case Code	Maximum Weight (Grams)
A	2.6
B	6.2
C	11.6
D	17.7

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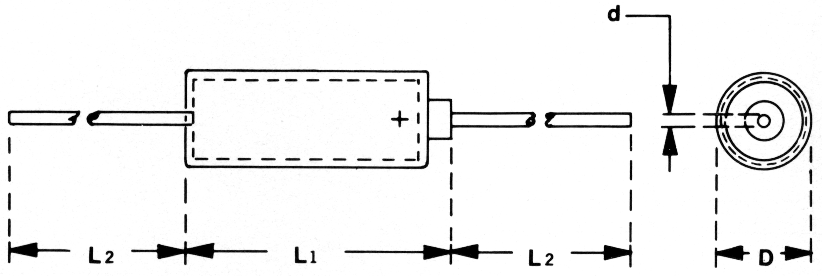
SPRAGUE ELECTRIC COMPANY	EIA Ref: QC300202US0001 September 1983
ELECTRONIC COMPONENTS OF ASSESSED QUALITY IN ACCORDANCE WITH IEC 384-1 (1982) QC300000	IEC 384-15-2 QC300202
Outline Drawing: (See Table 1) (First Angle Projection)  Dwg.No. A-12,252 (Other shapes are permitted within the dimensions given)	FIXED TANTALUM CAPACITORS WITH NON-SOLID ELECTROLYTE AND POROUS ANODE TANTALUM CASE, AXIAL LEAD, HERMETICALLY SEALED, POLARIZED, INSULATED Assessment Level: E Performance Grade: Long Life PREMIUM QUALITY HIGH RELIABILITY DESIGN FOR THE MOST DEMANDING APPLICATIONS

Information on the availability of components qualified to this detail specification is given in the EIA Qualified Products List.

PART ONE. GENERAL DATA

1. GENERAL DATA

1.1 RECOMMENDED METHODS OF MOUNTING

a. By leads in absence of vibration or shock.
b. By body clamp and leads if vibration or shock can exist.

1.2 DIMENSIONS

TABLE I

CASE CODE	DIMENSIONS (in mm)			
	L_1 (max)	D (max)	L_2 (min)	d $^{+10\%}_{-5\%}$
A	18	5.8	25	0.6
B	23	7.4	25	0.6
C	26	10.1	25	0.6
D	34	10.1	25	0.6

1.3 RATINGS AND CHARACTERISTICS

Capacitance range.......................... (See Table II)
Tolerance on rated capacitance.......... (±5, ±10, ±20%)
Rated voltage.............................. (See Table II)
Category voltage (if applicable)............. (See Table II)
Climatic category .... (55/125/56)
Rated temperature................................ (85 °C)
Variation of capacitance with temperature..... (See Table II)
Tangent of loss angle...................... (See Table II)
Leakage current............................ (See Table II)
Impedance.................................. (See Table II)
Reverse voltage ....(See 4.14) IEC pub 384-15 (QC300200)

TABLE II

U_R 85°C (VDC)	U_C 125°C (VDC)	C_R (1) 20°C (μF)	Maximum Capacitance Change (%) at: (2) -55°C	85°C	125°C	Maximum Values (3) Tg δ (%) 20°C	Impedance (Ω) 120 Hz -55°C	D-C Leakage μA 20°C	85+ 125°C	Ripple Current mA (4)	Case Code
6.3	4	68	−40	+14	+16	18	60	1	2	960	A
6.3	4	270	−44	+17.5	+20	49	25	1	7	1375	B
6.3	4	560	−64	+17.5	+20	66	25	2	16	1900	C
6.3	4	1200	−80	+25	+25	113	20	4	16	2265	D
10	6.3	47	−36	+14	+16	16	100	1	2	855	A
10	6.3	180	−36	+14	+16	35	40	1	7	1300	B
10	6.3	390	−64	+17.5	+20	53	25	2	16	1800	C
10	6.3	820	−80	+25	+25	78	23	4	16	2360	D
16	10	33	−28	+14	+16	12	90	1	2	820	A
16	10	120	−28	+17.5	+20	29	50	1	9	1230	B
16	10	270	−56	+17.5	+20	54	30	2	16	1500	C
16	10	560	−80	+25	+25	53	23	6	24	2300	D
25	16	22	−20	+10.5	+12	8	140	1	2	800	A
25	16	100	−28	+13	+15	25	50	1	10	1215	B
25	16	180	−48	+13	+15	35	32	2	18	1460	C
25	16	390	−70	+25	+25	48	24	7	28	1970	D
40	25	12	−24	+ 8	+10	7	195	1	2	650	A
40	25	56	−28	+13	+15	16	65	1	9	1100	B
40	25	100	−40	+13	+15	21	40	2	17	1400	C
40	25	220	−55	+25	+25	32	26	8	32	1880	D
63	40	8.2	−24	+ 8	+ 9	5	275	1	2	625	A
63	40	39	−28	+10.5	+12	14	90	1	9	1015	B
63	40	68	−32	+10.5	+12	15	50	2	16	1365	C
63	40	150	−40	+20	+20	21	28	8	32	1850	D
80	50	6.8	−20	+ 8	+ 9	6	300	1	2	610	A
80	50	33	−24	+10.5	+15	12	90	1	10	1000	B
80	50	56	−28	+10.5	+15	13	60	2	17	1335	C
80	50	100	−35	+20	+20	14	30	9	36	1850	D
100	63	4.7	−16	+ 7	+ 8	3.5	500	1	2	565	A
100	63	22	−16	+ 7	+ 8	9	110	1	9	935	B
100	63	47	−20	+ 7	+ 8	10	70	2	17	1335	C
100	63	82	−25	+15	+15	12	33	9	36	1800	D
125	80	3.9	−16	+ 7	+ 8	4	600	1	2	495	A
125	80	15	−16	+ 7	+ 8	7	167	1	7	860	B
125	80	27	−16	+ 7	+ 8	7	88	2	13	1200	C
125	80	56	−25	+15	+15	8	48	10	40	1800	D

(I) Tolerance of C_R: ±20%, ±10% and ±5%
(2) Compared to the measured value at 20°C
(3) The maximum values of Tgδ are the same at 20, 85 and 125°C
(4) Maximum ripple current (RMS) at 85°C at 40 kHz. For other temperatures and frequencies, see Table 3.
(5) All a-c measurements on 100 and 125 volt capacitors will be made with a d-c bias of 10 +0.0 −1.0 VDC.

TABLE IIA
RIPPLE CURRENT MULTIPLIERS VS FREQUENCY, TEMPERATURE, AND APPLIED PEAK VOLTAGE.

Frequency of applied ripple current	100-120 Hz				800 Hz				1 kHz			
	Temp °C				Temp °C				Temp °C			
Ambient still air	≤55°	85°	105°	125°	≤55°	85°	105°	125°	≤55°	85°	105°	125°
% of 85°C rated peak voltage 100%	.60	.39	—	—	.71	.43	—	—	.72	.45	—	—
90%	.60	.46	—	—	.71	.55	—	—	.72	.55	—	—
80%	.60	.52	.35	—	.71	.62	.42	—	.72	.62	.42	—
70%	.60	.58	.44	—	.71	.69	.52	—	.72	.70	.52	—
≤66 2/3%	.60	.60	.46	.27	.71	.71	.55	.32	.72	.72	.55	.32

Frequency of applied ripple current	10 kHz				40 kHz				100 kHz			
	Temp °C				Temp °C				Temp °C			
Ambient still air	≤55°	85°	105°	125°	≤55°	85°	105°	125°	≤55°	85°	105°	125°
% of 85°C rated peak voltage 100%	.88	.55	—	—	1.0	.63	—	—	1.1	.69	—	—
90%	.88	.67	—	—	1.0	.77	—	—	1.1	.85	—	—
80%	.88	.76	.52	—	1.0	.87	.59	—	1.1	.96	.65	—
70%	.88	.85	.64	—	1.0	.97	.73	—	1.1	1.07	.80	—
≤66 2/3%	.88	.88	.68	.40	1.0	1.0	.77	.45	1.1	1.1	.85	.50

1.4 RELATED DOCUMENTS

QC numbers referenced in this bulletin identify the International Electrotechnical Commission (IEC) standards which govern the capacitors listed herein. These devices are offered by Sprague Electric Company in accordance with the standards listed below and appear on the Qualified Products List (QPL) for the IECQ-System. Copies of the QPL and referenced IEC standards may be obtained from the Electronic Industries Association (EIA) 2001 Eye Street, N.W., Washington, D.C. 20006.

QC300202/US0001 (1983) Detail specification:
Fixed Tantalum Capacitors with Non-Solid Electrolyte and Porous Anode

QC300202 (1983) Blank Detail specification:
Fixed Tantalum Capacitors with Non-Solid Electrolyte and Porous Anode. (Publication 384-15-2)

QC300200 (1982) Sectional specification:
Fixed Tantalum Capacitors with Non-Solid or Solid Electrolyte. (Publication 384-15)

QC300000 (1982) Generic specification:
Fixed Capacitors for use in Electronic Equipment. (Publication 384-1)

1.5 MARKING

The marking of the capacitor and the packing shall be in accordance with the requirements of IEC Publication 384-15 (QC300200) Sub-cl. 1.6.

The following items are to be marked on the capacitor:
a) Rated capacitance in microfarads.
b) Rated DC voltage in volts.
c) Polarity identification by one or more positive signs near the positive termination.
d) Tolerance code per IEC Publication 62. The code letter will follow the marking of rated capacitance per item a or will be on a separate line.
e) Date code per IEC Publication 62.
f) Manufacturer's name or trade mark.
g) Manufacturer's type designation (optional).
h) Reference detail specification (optional).

1.6 ORDERING INFORMATION

Orders for capacitors covered by this specification shall contain, in clear or in coded form, the following information:
a) Number of the detail specification (Sprague Type 135DY).
b) Rated capacitance.
c) Tolerance on rated capacitance.
d) Rated d-c voltage.
e) Style reference.

1.7 CERTIFIED RECORDS OF RELEASED LOTS

Required.

1.8 ADDITIONAL INFORMATION (not for inspection purposes)

1.9 ADDITIONAL OR INCREASED SEVERITIES OR REQUIREMENTS TO THOSE SPECIFIED IN THE GENERIC AND/OR SECTIONAL SPECIFICATION

See table III

TABLE III
OTHER CHARACTERISTICS

TEST	TYPE OF CHANGE	DETAIL OF CHANGE	
SINUSOIDAL VIBRATION	SEVERITY INCREASE	ACCELERATION INCREASED TO 80*g*	
SHOCK	SEVERITY INCREASE	ACCELERATION INCREASED TO 500*g*	
RAPID CHANGE OF TEMP	SEVERITY INCREASE	NUMBER OF SHOCKS INCREASED TO 300	
SEAL	ADDED	TEST Qk, PUB. 68-2-17 (TRACER GAS)	*
RANDOM VIBRATION	ADDED	TEST Fda, PUB 68-2-35	*

*These tests comprise Sub-group C-5, an additional subgroup to those specified by the blank detail specification. For qualification, 3 units of each test value constituting a new Group 6 will be tested as shown in Sub-group C-5 of this specification.

PART TWO INSPECTION REQUIREMENTS

2.1 PROCEDURES

2.1.1 For Qualification Approval the procedures shall be in accordance with the Sectional Specification, at present IEC Publication 384-15 (QC300200), Subclause 3.4.

2.1.2 For Quality Conformance Inspection the test schedule (Table IV) includes sampling, periodicity, severities and requirements. The formation of inspection lots is covered by Sub-cl. 3.5.1 of the Sectional Specification.

TABLE IV

Note 1: Clause numbers of tests and performance requirements refer to the Sectional Specification, IEC Publication 384-15 (QC300200) and Part One of this specification.

Note 2: Inspection Levels and AQL's are selected from IEC Publication 410.

Note 3: In this table:
- p = Periodicity (in months)
- n = sample size
- c = acceptance criterion (permitted number of defectives)
- D = destructive
- ND = non-destructive
- IL = inspection level } IEC 410
- AQL = acceptable quality level } IEC 410

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	IL (See Nt 2)	AQL (See Nt 2)	Performance requirements (See Note 1)
GROUP A INSPECTION (Lot-by-lot)					
Sub-Group A1	ND		S-4	2.5%	
4.1 Visual examination					As in 4.1 Legible marking and as specified in 1.5 of this specification
4.1 Dimensions (gauging)					As specified in Table I of this specification
Sub-Group A2	ND		II	1.0%	
4.2.1 Leakage current		Protective resistance: 1K-10K			See Table II
4.2.2 Capacitance		Frequency: 120Hz			Within specified tolerance
4.2.3 Tangent of loss angle		Frequency: 120Hz			See Table II
4.2.4 Impedance		Not required			

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	IL (See Nt 2)	AQL (See Nt 2)	Performance requirements (See Note 1)
GROUP B INSPECTION (Lot-by-lot)					
Sub-Group B1	D		S-3	2.5%	
4.5 Solderability		Without ageing Method: Solderbath (1A)			Good tinning as evidenced by free flowing of the solder with wetting of the terminations
Sub-Group B2	ND		S-3	2.5%	
4.15 Characteristics at high and low temperature		The capacitors shall be measured at each step			
		Step 1: 20°C Leakage current Capacitance Tangent of loss angle			For use as reference value
		Step 2: Lower category Temperature (– 55°C)			
		Capacitance			See Table II
		Tangent of loss angle			
		Impedance			See Table II
		Step 3: Rated Temperature (85°C)			
		Leakage current			See Table II
		Capacitance			See Table II
		Tangent of loss angle			See Table II
		Step 4: Upper category Temperature (125°C)			
		Leakage current			See Table II
		Capacitance			See Table II
		Tangent of loss angle			See Table II

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3)			Performance requirements (See Note 1)
GROUP C INSPECTION (Periodic)			p	n	c	
Sub-Group C1A	D					
Part of sample of Sub-Group C1			6	9	1	
4.3.1 Initial measurement		Capacitance				
4.3 Robustness of terminations		Visual examination				No visible damage and no leakage of electrolyte
4.4 Resistance to soldering heat		Method: 1A Test Tb (Immersion time 10 ± 1s)				
4.4.2 Final measurements		Visual examination				No visible damage and no leakage of electrolyte Legible marking
Sub-Group C1B	D		6	18	1	
Other part of sample						
4.6.1 Initial measurement		Capacitance				
4.6* Rapid change of temperature		T_A = Lower category temperature T_B = Upper category temperature 300 cycles Duration t = 30 min				
4.6.3 Final measurements		Leakage current				2 × Table Value
		Capacitance				$\Delta C \leqslant 5\%$ compared to $\overline{C}$ values measured in 4.6.1
		Tangent of loss angle				$\leqslant$ 115% of Table II value
4.7* Vibration		Method of mounting: see 1.1 of this specification Procedure B4 Frequency range: 10 to 2000Hz				

*See 1.9

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3) p	n	c	Performance requirements (See Note 1)
		Amplitude: 0.75 mm or acceleration 80*g*, whichever is the less severe Total duration: 6h Monitor per clause 4.17.3 of IEC 384-1 (QC300000)				No opens, shorts, or intermittent contacts ⩾.5 m S
4.7.2 Final measurements		Visual examination				No visible damage and no leakage of electrolyte
4.9* Shock		Method of mounting: see 1.1 of this specification Acceleration: 4900m/s^2 Duration of pulse: 1ms Rated voltage applied				
4.9.2 Final measurements		Visual Examination				No visible damage and no leakage of electrolyte
Sub-Group C1 Combined sample of specimens of Sub-Groups C1A and C1B	D		6	27	1	
4.10 Climatic sequence						
4.10.1 Initial measurement		Capacitance				
4.10.2 Dry heat		Temperature: Upper category temperature Duration: 16h Visual examination				No visible damage and no leakage of electrolyte
4.10.3 Damp heat, cyclic, test Db, first cycle						

*See 1.9

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3)			Performance requirements (See Note 1)
			p	n	c	
4.10.4 Cold		Temperature: Lower category temperature Duration: 2h Visual examination				No visible damage and no leakage of electrolyte
4.10.5 Low air pressure		Air pressure: 8.5kPa (85 mbar) Temperature: 15 to 35°C Duration: 5 min Last minute of test: U_R				
4.10.5.3 Intermediate measurement		Visual examination				No breakdown, flash-over or harmful deformation of the case
4.10.6 Damp heat, cyclic, test Db, remaining cycles		Rated voltage applied				
4.10.7 Sealing		Method: 2, Test Qc, using mineral oil or fluorocarbon liquid				No repetitive bubbles
4.10.8 Final measurements		Visual examination Leakage current Capacitance Tangent of loss angle				No visible damage and no leakage of electrolyte Legible marking See Table II ΔC: 5% max from value measured in 4.10.1 ΔC: 8% max from value measured in 4.3.1 cr 4.6.1 as applicable See Table II
Sub-Group C2	D		6	9	1	
4.11 Damp heat, steady state		Rated voltage applied Duration: 56 days				
4.11.1 Initial measurement		Capacitance				

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3)			Performance requirements (See Note 1)
			p	n	c	
4.11.2 Final measurements		Visual examination Leakage current Capacitance Tangent of loss angle				No visible damage Legible marking $\leqslant$ initial limit ΔC: 5% max compared to C values measured in 4.11.1 $\leqslant$ 1.15 times initial limit
4.2.5		Insulation resistance of the external insulation				$\geqslant$100 MΩ
4.2.6		Voltage proof of the external insulation				No breakdown or flashover
Sub-Group C3	D		3	24	1	
4.12 Endurance		Duration 2000h 12 units at 125°C with voltage per table 2 12 units at 85°C with 120Hz ripple current per Tables 2 & 2A. DC voltages = RV-VAC ripple (Peak) Recovery: 16h				
4.12.1 Initial measurement		Capacitance				
4.12.3 Final measurements		Visual examination Leakage current Capacitance Tangent of loss angle				No visible damage Legible marking See Table II ΔC: $\leqslant$ 10% compared C to values measured in 4.12.1 See Table II
Sub-Group C4A	D		12	6	1	
4.13 Surge		Number of cycles: 1000 3 units at 125°C 3 units at 85°C Protective resistor: 1000 Ω ± 10%				

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3)			Performance requirements (See Note 1)
			p	n	c	
		Duration of charge: 30 s Duration of discharge: 5 min 30 s				
4.13.1 Initial measurement		Capacitance				
4.13.3 Final measurements		Leakage current				≤ initial limit
		Capacitance				$\frac{\Delta C}{C}$: ≤ 10% compared to values measured in 4.13.1
		Tangent of loss angle				≤ 1.3 times initial limit
Sub-Group C4B	D		12	6	1 1	
4.14 Reverse voltage		Upper category temperature with a voltage of 3V, in reverse polarity direction, during 125h, followed by 125h at upper category temperature with category voltage in forward polarity direction				
4.14.1 Initial measurement		Capacitance				
4.14.3 Final measurements		Leakage current				≤ 1.25 times initial limit
		Capacitance				$\frac{\Delta C}{C}$ ≤ 10% compared to values measured in 4.14.1
		Tangent of loss angle				≤ 1.15 times initial limit

Clause number and Test (See Note 1)	D or ND	Conditions of test (See Note 1)	Sample size & criterion of acceptability (See Note 3)			Performance requirements (See Note 1)
			p	n	c	
Sub-Group C5*	D		12	6	1	
Seal test*		Test Qk, Publication 68-2-17 Remove ins. sleeve and marking Precleaning: 30 ± 15 s vapor degrease in trichloroethylene Tracer gas: Helium Pressure: 4 atmospheres Pressurization time: 4h Cleaning after press-urization: Expose units to airstream max 5 min				Maximum leak rate: 10^{-8} ATM cc/sec (air equivalent)
		Following above test, perform test Q_c Method 2 using mineral oil or fluorocarbon liquid UCT = 125°C				No repetitive bubbles
Random vibration*		Test Fda, Publication 68-2-35				
Initial measurement		Capacitance				
		Frequency: 50 to 2000 Hz ASD level: $1.0g^2$/Hz Duration: 1h in each of 3 mutually perpen-dicular directions Reproducibility: high Measurements during test: Monitor for intermittents during last 3 minutes in each direction **				No intermittency
		Visual examination				No visible damage
		Leakage current				≤ 125% of Table II value
		Capacitance				ΔC ≤ 5% of value measured prior to this test.
		Tangent of loss angle				≤ 115% of Table II value

**Mounting: Cast in paraffin wax or mount by full length body clamp.
*See 1.9

WARNING! DO NOT MISAPPLY TANTALUM ELECTROLYTIC CAPACITORS

1. Caution Against Misapplication. Here are the most common forms of misapplication:

(a) Exposure to reverse voltage in excess of specified limits. (No reverse voltage allowed on many types. See cognizant specification.)

(b) Exposure to temperatures above specified limit.

(c) Application of voltage beyond specified surge voltage.

(d) Application of excessive ripple current or voltage. Do not exceed specification limits.

2. Personnel Safety. *Electrical misapplication* of tantalum electrolytic capacitors containing fluid electrolyte *may be hazardous*. Personal injury or property damage may result from explosion of a capacitor or from expulsion of electrolyte due to mechanical disruption of a capacitor.

Skin, eye, or mouth exposure to electrolytes in tantalum electrolytic capacitors **MUST BE TREATED IMMEDIATELY!**

2.1 Eye Contact. *Contact lenses must be removed at once. Immediately flush the open eye(s) for 15 minutes with large amounts of water.* If pain is experienced, apply 2 drops of 0.5% tetracaine (Pontocaine). *Seek immediate medical attention.*

2.2 Skin or Clothing Contact. *Flush thoroughly with running water* as soon as possible after contact, and then wash with soap and water or a mild detergent.

2.3 Mouth Contact or Accidental Swallowing. *Drink large quantities of water or milk.* Follow with Milk of Magnesia, beaten egg, or vegetable oil. *Call physician immediately.*

In the construction of the components described, the full intent of the specification will be met. The Sprague Electric Company, however, reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. Components made under military approvals will be in accordance with the approval requirements.

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